What is claimed is:

1. A network for routing a plurality of data segments therethrough, each of the data segments containing an address information, the network comprising:

a first, second, and third switch element each comprising a respective external input for routing data segments into the network and a respective external output for routing data segments out of the network;

a first bi-directional coupling between said first and second switch elements, a second bi-directional coupling between said first and third switch elements, and a third bi-directional coupling between said second and third switch elements; and

a first controller for interrogating the address information of each of the data segments inbound into said first switch element, any of said inbound data segments received by said first switch element to be directed out along a selected exit pathway;

whereby said exit pathway for said any inbound data segment so received is selected according to the address information of said any inbound data segment, and if a contention exists for said exit pathway, further according to a priority designator of said any inbound data segment; said exit pathway to be selected from the group consisting of: if said first switch element is an outbound destination for said any inbound data segment, said first external output; and one of said bi-directional couplings in communication with said first switch element.

2. The network of Claim 1 wherein said external input is in direct communication with a first input-port processor; said external output is in direct communication with a first output-port processor; each said bi-directional coupling comprises an optical fiber link; and any of the data segments that arrive at said first input-port processor, do so as optical signals.

3. The network of Claim 2 wherein:

said first switch element comprises a photonic wavelength converter having at least one node to correspond with each of said external first input and said external first output, and at least two nodes to correspond with each of said bi-directional couplings in communication with said first switch element;

said external first input node and each of said nodes corresponding with an incoming-link of said bi-directional couplings is in direct communication with a respective optical wavelength demultiplexor; and

said external first output node and each of said nodes corresponding with an outgoing-link of said bi-directional couplings is in direct communication with a respective optical wavelength multiplexor.

4. The network of Claim 1 wherein said external input is in direct communication with a first buffer and an input-port processor; said external output is in direct communication with a first output-port processor; said first switch element comprises a crossbar switch having at least one node to correspond with each of said external first input and said external first output, and at least two nodes to correspond with each of said bi-directional couplings in communication with said first switch element; and any of the data segments that arrive at said first buffered input-port processor, do so as electrical signals.

5. The network of Claim 4 wherein:

any of the data segments entering said first buffer are held in a respective buffer slot thereof until permission to enter said first switch element is granted, on a first-in-first-out (FIFO) basis, by said first controller; and

said first controller to further: select said exit pathway and instruct said first switch element to so direct said any inbound data segment so received out of said first switch element, and update said priority designator of said any inbound data segment received for which said selected exit pathway is not along a generally direct route toward said any inbound data segment's outbound destination.

6. The network of Claim 5 further comprising:

a fourth, fifth, and sixth switch element each comprising a respective fourth, fifth, and sixth external input for routing data segments into the network and a respective fourth, fifth, and sixth external output for routing data segments out of the network; and

a fourth bi-directional coupling between said first and fourth switch elements, a fifth bi-directional coupling between said second and fourth switch

elements, and a sixth bi-directional coupling between said third and fourth switch elements, a seventh bi-directional coupling between said second and fifth switch elements; an eighth bi-directional coupling between said fourth and fifth switch elements; a ninth bi-directional coupling between said second and sixth switch elements; a tenth bi-directional coupling between said fifth and sixth switch elements; and an eleventh bi-directional coupling between said fourth and sixth switch elements.

7. The network of Claim 1 wherein: the address information comprises a destination address associated with said outbound destination; each said first, second, and third switch element has a respective first, second, and third location index associated therewith; said contention exists if said exit pathway initially selected for any two of said data segments received is, concurrently, the same; said external input is in direct communication with a first input-port processor; and said external output is in direct communication with a first output-port processor.

8. The network of Claim 7 wherein:

each of the address information further comprises a source address; said source address of said any inbound data segment received by said first switch element is updated by said first controller according to said first location index, if said updated source address is an equivalent of said destination address of said any inbound data segment received, said first switch element is said outbound destination therefor; and

said first controller to update said priority designator of said any inbound data segment so received for which said selected exit pathway is not along a generally direct route toward said any inbound data segment's outbound destination.

9. The network of Claim 7 further comprising:

a second controller for interrogating the address information of each of the data segments inbound into said second switch element, any of said inbound data segments received by said second switch element to be directed out along a second selected exit pathway; and

a third controller for interrogating the address information of each of the data segments inbound into said third switch element, any of said inbound data segments received by said third switch element to be directed out along a third selected exit pathway.

10. The network of Claim 9 further comprising:

a fourth switch element having a respective location index associated therewith and comprising a fourth external input for routing data segments into the network and a fourth external output for routing data segments out of the network; and

a fourth bi-directional coupling between said first and fourth switch elements, a fifth bi-directional coupling between said second and fourth switch elements, and a sixth bi-directional coupling between said third and fourth switch elements;

whereby said second exit pathway for said any inbound data segment received by said second switch element is selected according to the address information of said any inbound data segment, and if a contention exists for said second exit pathway, further according to a priority designator of said any inbound data segment; said second exit pathway to be selected from the group consisting of: if said second switch element is said outbound destination for said any inbound data segment, said second external output; and one of said bi-directional couplings in communication with said second switch element.

11. The network of Claim 10 further comprising:

a fifth and sixth switch element, each having a respective location index associated therewith and each comprising a respective external input for routing data segments into the network and a respective external output for routing data segments out of the network; and

a seventh bi-directional coupling between said second and fifth switch elements; an eighth bi-directional coupling between said fourth and fifth switch elements; a ninth bi-directional coupling between said second and sixth switch elements; a tenth bi-directional coupling between said fifth and sixth switch elements; and an eleventh bi-directional coupling between said fourth and sixth switch elements.

12. The network of Claim 11 wherein each of said bi-directional couplings extends along a generally shortest available path between said switch elements coupled thereby, and further comprising:

a fourth controller for interrogating the address information of each of the data segments inbound into said fourth switch element, any of said inbound data segments received by said fourth switch element to be directed out along a fourth selected exit pathway; and

a fifth controller for interrogating the address information of each of the data segments inbound into said fifth switch element, any of said inbound data segments received by said fifth switch element to be directed out along a fifth selected exit pathway.

13. The network of Claim 12 wherein said fourth exit pathway for said any inbound data segment received by said fourth switch element is selected according to the address information of said any inbound data segment received by said fourth switch element, and if a contention exists for said fourth exit pathway, further according to a priority designator of said any inbound data segment received; said fourth exit pathway to be selected from the group consisting of: if said fourth switch element is said outbound destination for said any inbound data segment received by said fourth switch element, said fourth external output; and one of said bi-directional couplings in communication with said fourth switch element.

14. A method for routing a plurality of data segments through a network having first, second, and third switch elements, the method comprising the steps of:

providing a first bi-directional coupling between said first and second switch elements, a second bi-directional coupling between said first and third switch elements, and a third bi-directional coupling between said second and third switch elements;

interrogating an address information of each of the data segments inbound into any of said first, second, and third switch elements routed by way of a respective external input; and

selecting an exit pathway for each of said inbound data segments received by a respective one of said switch elements according to said address information of said each data segment received, and if a contention exists for said exit pathway, further according to a priority designator of said each data segment received; said exit pathway to be selected from the group consisting of: if said respective switch element is an outbound destination for said each data segment received, a respective external output of said respective switch element; and one of said bi-directional couplings in communication with said respective switch element.

15. The method of Claim 14 wherein said contention exists if said exit pathway initially selected for any two of said data segments received is, concurrently, the same; and further comprising the steps of: updating said priority designator of any one of said each data segment received for which said selected exit pathway is not along a generally direct route toward said each data segment's outbound destination; and directing said each data segment received out along said selected exit pathway.

16. The method of Claim 14 further comprising the steps of: updating a source address of said each inbound data segment received by said respective switch element according to a respective location index thereof; if said updated source address is an equivalent of said destination address of said each data segment received, said respective switch element is said outbound destination therefor, and if said updated source address is not yet said equivalent, said exit pathway is selected from any one of said bi-directional couplings along a generally direct route toward said outbound destination of said each data segment received.

17. The method of Claim 14 wherein the data segments enter, as optical signals, into any one of said first, second, and third switch elements through a respective first, second, and third optical wavelength demultiplexor in communication with a respective first, second, and third input-port processor; and further comprising the steps of demultiplexing an incoming said optical signal at a first wavelength using one of said respective demultiplexors, and converting said wavelength of said incoming optical signal prior to directing the data segments thereof out along said selected exit pathway for multiplexing.

18. The method of Claim 14 wherein the data segments enter, as electrical signals, into any one of said first, second, and third switch elements through a respective first, second, or third buffer in communication with a respective first, second, and third input-port processor; and further comprising the step of holding the data segments in a respective one of a plurality of buffer slots of each of said buffers, until permission to enter said any first, second, or third switch element is granted, on a first-in-first-out (FIFO) basis.

19. The method of Claim 18 further comprising the steps of:

interrogating an address information of each of the data segments inbound into any of a fourth, fifth, and sixth switch elements;

providing a respective bi-directional coupling between said first and fourth switch elements, between said second and fourth switch elements, between said third and fourth switch elements, between said second and fifth switch elements, between said fourth and fifth switch elements, between said second and sixth switch elements, between said fifth and sixth switch elements, and between said fourth and sixth switch elements; and

updating said priority designator of each one of said inbound data segments received by any of said first, second, third, fourth, fifth, and sixth switch element for which said selected exit pathway is not along a generally direct route toward said each data segment's outbound destination; whereby if any of said first, second, third, fourth, fifth, and sixth switch element is not said outbound destination for said each inbound data segment received, then said exit pathway therefor is selected from any one of said bi-directional couplings.

20. A computer executable program code on a computer readable storage medium for routing a plurality of data segments through a network having first, second, and third switch elements, the program code comprising:

a first program sub-code for interrogating an address information of each of the data segments inbound into any of said first, second, and third switch elements; whereby a bi-directional coupling is provided between said first and second switch elements, between said first and third switch elements, and between said second and third switch elements; and

a second program sub-code for selecting an exit pathway for each of said inbound data segments received by a respective one of said switch elements according to said address information of said each data segment received, and if a contention exists for said exit pathway, further according to a priority designator of said each data segment received; said exit pathway to be selected from the group consisting of: if said respective switch element is an outbound destination for said each data segment received, a respective external output of said respective switch element; and one of said bi-directional couplings in communication with said respective switch element.

21. The program code of Claim 20 wherein:

said first program sub-code comprises instructions for reading said each inbound data segment into a respective one of a first, second, or third buffer in communication with a respective one of said first, second, and third switch elements, until permission to enter said respective switch element is granted, on a first-in-first-out (FIFO) basis; and

said second program sub-code comprises instructions for: determining whether said exit pathway initially selected for any two of said data segments received is, concurrently, the same; and if so, then reading and comparing said priority designator of each of said any two data segments received; and updating said priority designator of a one of said two data segments received for which said selected exit pathway is not along a generally direct route toward said one data segment's outbound destination.

22. The program code of Claim 20 wherein:

said first program sub-code further comprises instructions for updating a source address of said each inbound data segment received by said respective switch element according to a respective location index thereof; and

said second program sub-code further comprises instructions for: if said updated source address is an equivalent of said destination address of said each data segment received, said respective switch element is said outbound destination therefore; if said updated source address is not yet said equivalent, said exit pathway is selected from any one of said bi-directional couplings along a generally direct route toward said outbound destination of said each data segment received; and directing said each data segment received out along said selected exit pathway.